High Latitude Survey Figure of Merit

(HLS FoM)

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Outline

1. High Redshift QSOS (DS)
2. Galaxy Evolution/Structure (CC)
3. Cool and rare stars (EW)

1. High-Redshift Quasars

- We define two QSO FoM's, based on two distinct scientific questions:
  - The small number of brightest, highest redshift QSOs, which are the best background probes of the intervening universe
  - The large number of z>6 QSOs, going all the way down the QLF: faint-end of the QLF, AGN contribution to ionizing budget, QSO pairs, LSS, clustering to get halo masses, etc...

- Define FOM_{Q1} as the normalized number of QSOs detected by WFIRST at z>8 with M(1450) < -25 (corresponding to what SDSS does at z~4):

$$FOM_{Q1} = \kappa \int \int \Phi (M_{1450}, z)$$

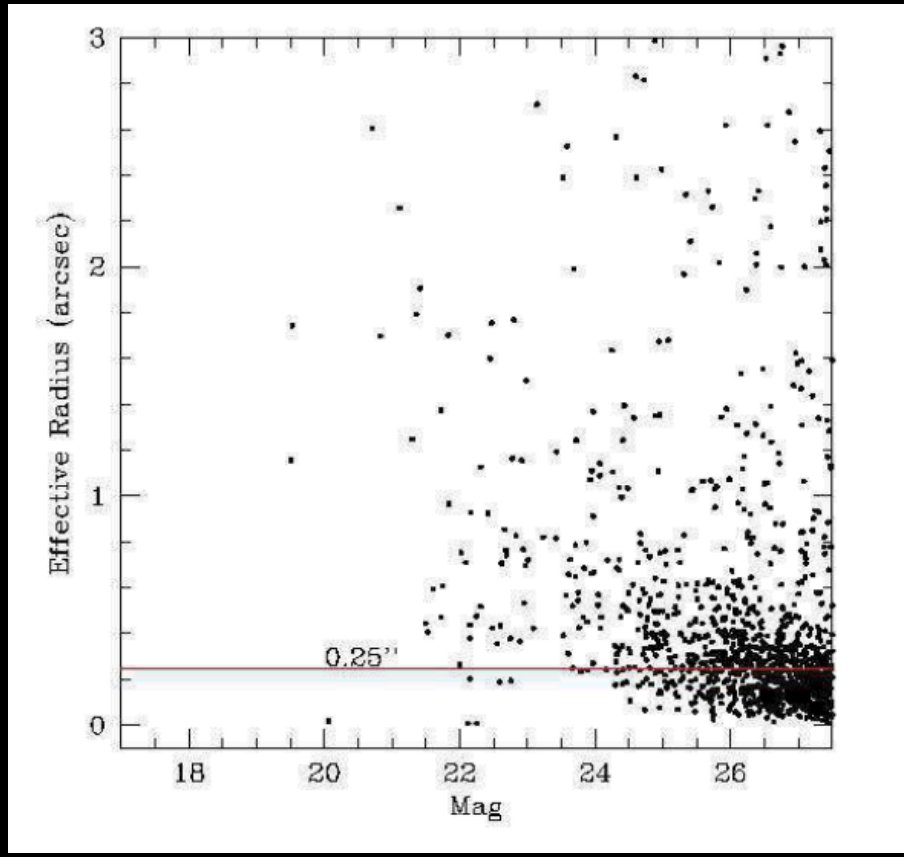
where κ is the normalization, the integrals are over the above specified ranges of absolute magnitude and redshift.

QSO FoM #2: The large number of QSOs at z>6.

Normal Galaxies FoM

Number of galaxies, N or 10^N
or completeness depth of L*+N(mag)

FoM – fraction of galaxies resolved to some magnitude limit, i.e., H =25, real example from Hubble UDF (right) finds FoM = 0.77 for 0.25arcsec PSF

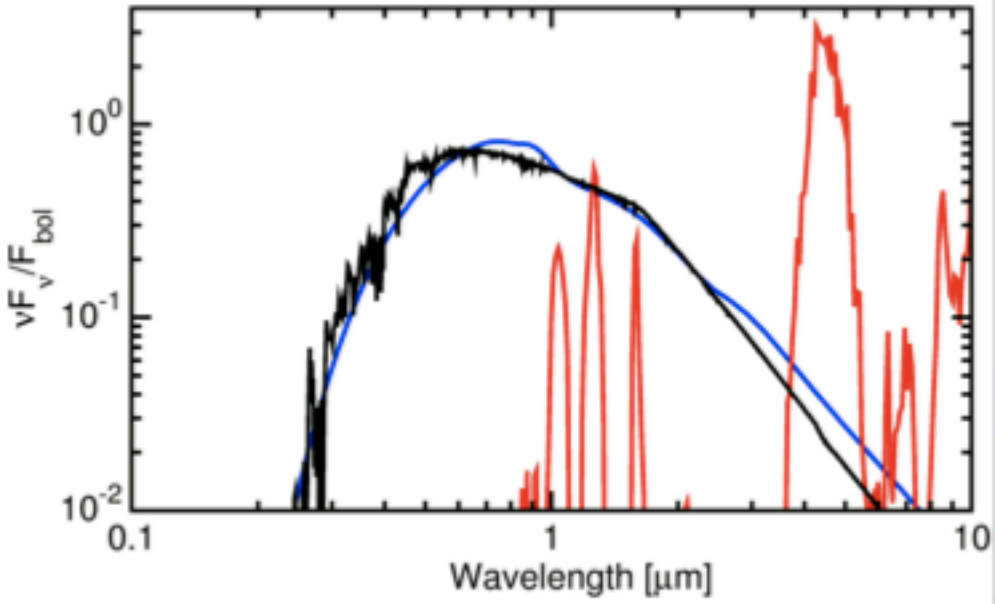


Drop-outs: ultra-high redshift galaxies, z > 7: (to depth of H~26)

FoM (z-drops) = 610*sq. degree surveyed
FoM (Y-drops) = 90*sq. degree surveyed
FoM (J-drops) = 80*sq. degree surveyed

Rare Stars

- Searching for rare stars requires a wide range of filters to separate them from the MS locus.
- WD spectrum is suppressed at 1.1 and 2.2 μm so optical and YJHKL filters are good.
- BD spectrum peaks at JH and M, so filters from 1-3.5 μm are good, 4.6 μm is ideal.
- Hundreds of cool WDs and cold BDs can be found.
- Euclidean source counts strongly favor wide survey.



- 4000 K WD showing H_2 CIA
- 325 K BD showing CH_4 dominated spectrum
- Best MS match to WD